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ON TIN "SALTING" ENTERPRISES IN THE UNITED STATES.

BY PROF. WM. K. KEDZIE.

Among the many elements which enter into, and add to the completeness of what we in egotistic phraseology term "our modern civilization," there are many most vitally important in their relations to the wants and necessities of civilized life, for which modern civilization is in no way responsible. They are the product, not of modern enterprise or industry; on the contrary, they are an inheritance, handed down to us from a remote and barbaric past.

Not the least important in its multitudinous and vital relations to the usages of civilized life, and for which we here to-day are mutually debtors to *pre*-civilized enterprise, may be mentioned the metal, TIN. The mere mention of the metal calls up before us the thousand-and-one uses and purposes which it subserves in every-day life. Whether in the form of block tin, or as a coating to inferior but more durable metals, such as iron or copper, or in the beautifully semi-crystalized condition known as *moire metallique*, or in the form of foil of one one-thousandth of an inch in thickness—so indispensable in the manufacture of mirrors; its brightness and beauty, almost equaling that of silver; its durability in air at ordinary temperatures—all conspire to render it a metal of incalculable value in the manufacture of articles of ornament and of every-day use.

And yet indispensable as we in this age and country have learned to regard this metal, it is interesting and instructive to note how little actual progress in the mining and metallurgy of tin has been made in the last three thousand years. For by this you will see that I place the discovery and first manufacture of tin from its ores, at a point far antedating the birth of the Christian era. No learned savant in the old world of alchemy has been able to hand his name down to posterity, linked with so all important a discovery.

To give the exact date of the introduction of tin would be quite as impossible and as difficult as to name the discoverer of gunpowder, or of the manufacture of glass. In the books of Moses we are told at one point of the "gold and the silver, the brass and the *tin*." Under the cabalistic sobriquet of *Kassiteros*, Homer sings of it in the Iliad, as that which gave strength and splendor to the battle-shields of Trojan warriors. By the writings of Pliny and others, we know that as early as between the years 1030 and 1040 before the birth of Christ, the Phœnicians had begun to avail themselves of the immense tin deposits of Cornwall, in the British Isles. And strange as it may appear, these same old mines of Cornwall, after 3,000 years of hard usage, are still the great tin producers of the world, giving us annually from their apparently inexhaustible resources 140,000 hundred-weight of the pure metal. Since the time when the Phœnicians began the transportation of this metal across the English Channel, how comparatively little has been accomplished in the new discovery and developement of tin deposits. To be sure, we now have the mines of Banca and Malacca, yielding their annual 100,000 hundred-weight. Then, too, there are the remarkable mines of Bolivia, the reported yield of which has however, in all probability, been greatly exaggerated. Then may be enumerated the lesser deposits of Bohemia, Saxony, and Australia, and associated with the mineral Cryolite ($Al_2F_3,3NaF$,) to some considerable extent in Greenland. The Australian tin ore contains also so large a percentage of gold that it may be extracted with profit. Within the past year also a new deposit of most promising character has been discovered upon the MacIntyre river in Australia, which bids fair to rival either Cornwall or Banca in its wealth.

The remarkable absence of anything approaching the character of tin deposits in the United States has been a most unwelcome fact which has long perplexed mineralogists. Not that the mineral *Cassiterite* or *Tin Stone* is entirely absent; for very slight deposits may be found near the town of Chesterfield, Pa.—associated with albite and tourmaline—also near Jackson, N. H., Paris, Maine, in the gold fields of Virginia, in Idaho, and in California. But in all these localities the metal exists only in such quantities as to be purely of mineralogical, never of metallurgical importance. It is but proper to remark, however, that the supposition is entertained by some that the deposits of San Bernardino county, California, may yet prove of commercial interest, when more fully examined.

Now in a territory so richly endowed as is that of the United States, with all the mineralogical wealth that the needs of a high civilization could demand, this lamentable poverty in the matter of tin deposits evinces an unwarrantable short-sightedness on the part of nature. To be compelled to resort to our more favored English brethren on the other side of the Atlantic for a requisite supply of the needed metal has long been a subject of national chargin. This impoverished condition of our tin resources has plainly been long felt by American patriotism as a great and a national reproach upon the character of a progressive commonwealth! At least upon no other adequate basis can we explain the efforts to supply this deficiency by the innumerable *tin-salting enterprises* which the last twenty years have witnessed in this country, some of which have been conceived and carried out upon a stupendous scale and with unfaltering energy. It is among these undertakings that the recent "tin mountain" excitement in Missouri may be classified; in some respects one of the most laughable instances in the whole calendar of tin frauds, closing with a grand railroad excursion, in which a credulous public is said to have stood gaping around two chemists, who were supposed to have produced the metal from a rock about as destitute of true cassiterite (tin stone) as a specimen of Jura limestone!

It is among these instances that these isolated "tin discoveries" are, even in our midst in Kansas, constantly taking place. I am in constant receipt, at my laboratory, of packages of ore from various parts of the State, supposed to abound in tin. Not infrequently a neat little ingot of the pure metal, said to have been found in close proximity to the ore, accompanies each package — the discoverer evidently forgetting that pure tin is one of the rarest elements in the whole realm of mineralogy. But it is to one of these enterprises in particular, even now in progress, and which can hardly be considered other than a case of "salting," that I desire to-day to call your attention, having been myself an amused spectator of the undertaking. I refer to the "Otter Head Consolidated Tin Land Pool" of the region north of Lake Superior. The marvelous accounts of this territory report it as furnishing not only the sulphide of tin, (SnS_2 generally combined with sulphides of iron and copper,) which has hitherto been known only in Cornwall, England, where it passes under the name of bell-metal ore, but in addition also an abundance of the genuine Cassiterite—tin-stone (SnO_2)—in all its forms of hard, brown-black, glittering octahedral crystals; before the blowpipe alone infusible, but readily yielding globules of metallic tin when fused upon charcoal with a flux. The modifications of Cassiterite are also said to be here afforded in their various botryoidal forms known as "wood-tin" and "toad's eye," from its peculiarly concentric and radiated structure; and last but most incredible part of the whole account, *native* or *metallic tin* which heretofore has been known only as an exceedingly rare native metal, found occasionally in the gold washings of Bolivia and in Siberia. Early in the past year an elaborate article appeared in the New York *Herald*, giving an account of the supposed discovery of these mines. It seems that some years ago, off the entrance to Thunder Bay, on Lake Superior, the famous Silver Islet was discovered, which now, under the direction of a large company, is yielding an immense profit. Stimulated by this discovery, the whole north shore of the lake was soon covered by earnest explorers. As a portion of the fruit of their investigations, gold in quartzose rock was said to have been found in the region about Shenandowan Lake, though in consequence of an unsettled dispute between the provinces of Manitoba and Ontario as to the right and title of the land, the discovery was maintained a profound secret. A portion of this same party of discoverers operating in other directions toward the south and east, reported themselves as finding, in the immediate vicinity of Otter Head, on the Canada shore, extensive veins of dark-colored ore of a high specific gravity, specimens of which they brought with them on returning. These specimens are filled with well-defined crystals of Cassiterite, which may readily be detected with a glass of low magnifying power. Upon assay they yield an abundance of metallic tin. It is said that the discoverers first supposed them to be iron ores, on account of their dark color, but the assay failed to yield metallic iron in sufficient quantity to account for their high specific gravity. A white metal was also produced as a part product of the assay, and was at first taken to be silver, as silver was the metal they were seeking. A more critical examination, however, proved this product to be metallic tin.

This valuable metal being heretofore supposed to be an utter stranger upon this continent, this supposed discovery created, as might have been expected, much comment and an unusual degree of interest. No more propitious a locality for such a venture, supposing it to be a fraudulent one, could have been possibly conceived. Around the exact point of the so-called discovery, at Otter Head, about midway between the canal of Sault Ste. Marie and Thunder bay, the country is eminently wild, solitary and romantic. Heavy granite cliffs rise from the shore of the lake to the height of a thousand feet. A few wandering Chippewa Indians may be found in the district, but not a white man can be seen within fifty miles of this point. From the extremely precipitous character of the territory, extensive inland travel is an utter impossibility; hence, much of the exploration must be confined to the lake shore. Early in May, 1873, I received from the secretary of the "Otter Head Tin Pool" a considerable quantity of the ore, accompanied by a printed pamphlet embodying the report of the trustees of the company. The ore was certainly of an unexceptionable character, dark-gray in color, and heavily charged with crystals of Cassiterite. Much of it was in the condition called stream tin — a rich, fine ore, produced by the washing action of running water. It yielded on assay from fifteen to thirty-five per cent. of clean metal. This ore was also remarkably free from the injurious mineral Wolframite (tungstate of iron and manganese $Fe Mn WO_4$), from which, as its specific gravity is nearly the same as that of Cassiterite, it is frequently extremely difficult to separate the ore. I also forwarded specimens of the ore to Prof. O. D. Allen, of the Sheffield Scientific School of Yale College, who stands as the acknowledged head of American metallurgy. He pronounced the specimens rich in tin, but at the same time intimated to me his suspicions that the enterprise was a "salted" one. Dr. John Torrey, of the United States assay office at New York city, before his death, also assayed the ore, and reported as follows: "The ore is a true Cassiterite, or tin-stone mixed with quartz; some of it is massive, but a considerable portion of the examined specimen is in the form of small, translucent, quadrangular prisms, some of which are perfectly terminated. The average of the samples yielded 33.3 per cent. of metallic tin." Similar assays were also made by Dr. Jennings, of Detroit, and by Drown and Carliss, of Philadelphia, all testifying to the promising character of the ore. When we remember that pure Cassiterite itself affords but 78.38 per cent. metallic tin, we can better appreciate the rich results obtained by Dr. Torrey.

Stimulated by these flattering indications, the company already designated as the "Otter Head Tin Land Pool," was organized, a tract of land to the extent of 28,314½ acres was purchased, shares issued and thrown upon the market, and, as may be supposed, were for a time in ready demand. In the report of the trustees of this organization are displayed apparently well-authenticated accounts of individuals exploring this region. The veins are described as well defined, and fully five hundred in number. Their courses are said to be generally well marked from northeast to southwest, with a dip of eighty degrees to the south. In width they are said to vary from an inch to six and eight feet, and to extend miles inland. The veins are also said to cross each other, forming at their intersections deposits designated by the Germans as *stockwert*. The value of the dressed ores, as given in the report, is estimated to vary from $23 to $369 per ton. But notwithstanding all these very promising indications and the apparently frank and minute statement of details, many doubtful circumstances soon created suspicion that the whole enterprise was a "salted" undertaking. Time has only served to confirm this suspicion in the minds of many, and the market value of the stock is now immensely depreciated. If such should prove to be the case, the query now arises, from whence was this rich ore obtained? Rumors have reported the finding of the boxes and barrels in which the ore was supposed to have been transported, in close proximity to the so-called veins; and also of the vessels in which the metallic tin was melted and judiciously distributed, though the latter can hardly be accredited. But let us remember that such an undertaking by no means argues a dishonest purpose in the minds of many or even most of those engaged therein. This consolidated Tin Land Pool numbers among its members many sincere and honorable men, who are now extensively purchasing the stock at its greatly depreciated value. But let us also bear in mind that the problem of deceiving even skilled metallurgists is by no means a difficult one. How much more easily, then, may those be misled who are unschooled by experience in mining matters?

The chemist, in collecting his specimens from the mine which he is called upon to examine, gathers them in small canvas bags. These, speedily becoming too heavy for convenient transportation, are deposited at convenient points, to be collected at the close of the exploration. How easy to replace them by similar bags containing a far richer ore! It was by this very process that an Eastern capitalist was recently very nearly swindled out of $206,000 by the analysis of his own chemist.

In conclusion, then, until the "Lake Superior Tin Land Pool" shall have given us abundant pledges of its good faith in the form of ingots of fine tin thrown upon the market, we cannot do otherwise than number it as one of the great fraudulent enterprises of the age.

K. S. A. C. Chemical Department, October, 1874.

BRACHIOSPONGIA.

BY REV. HORACE C. HOVEY, M. A.

During a geological trip in 1855, I discovered a new genus of fossil sponge, which, although extra-limital, may be worthy of a brief notice. My first specimen was exhibited to Prof. L. P. Yardell, of Louisville, Kentucky, and while in his hands it was seen and described by Prof. D. D. Owen. (Second Report of Geology of Kentucky, p. 111.) He styled it an amorphozoon, and suggested the name of "*Scyphia digitata*." I doubt if he ever saw the fossil in